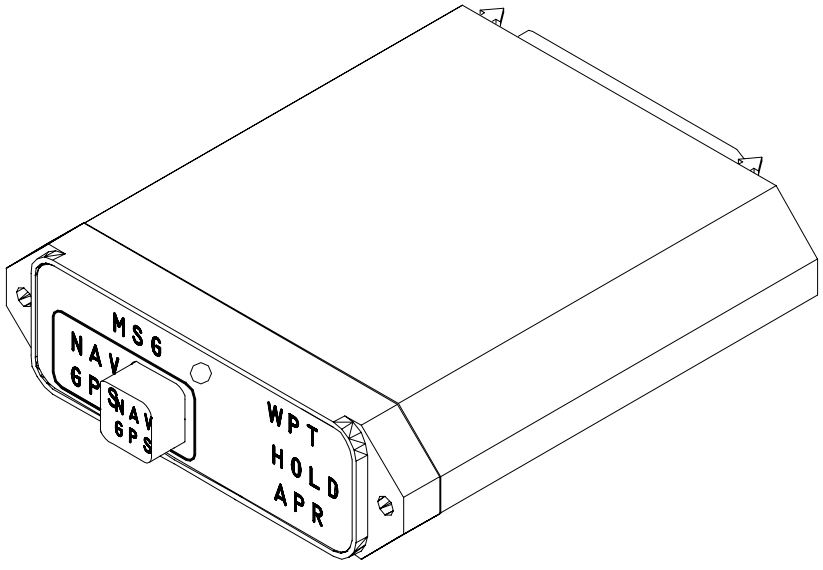
MID-CONTINENT INSTRUMENTS

INSTALLATION MANUAL AND OPERATING INSTRUCTIONS

MD41-( ) Series GPS ANNUNCIATION CONTROL UNIT FOR TRIMBLE 2000APR, 2000APR PLUS, 2101, 2101 PLUS, 2101 I/O, 2101 I/O PLUS and AN/ASN-175

MD41-1628	28vdc	Horizontal Mount
MD41-1638	28vdc	Vertical Mount (shown on page 11)
MD41-1624	14vdc	Horizontal Mount
MD41-1634	14vdc	Vertical Mount (shown on page 11)



MID-CONTINENT INST. CO., INC **MANUAL NUMBER 8013567**
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MANUAL REVISION AND HISTORY

MANUAL: MD41-1624, -1634, -1628, -1638, -1628(5v), -1638(5v)
REVISION: Oct. 26, 1997 Rev. 1
MANUAL NUMBER: 8013567

This revision level of this manual consist of the following changes:

Added AlliedSignal KI 208A/209A Navigation Indicators to be used with the MD41-162X/163X series ACU in place of the MD41-244/248 series Relay Units.

REVISION: Aug. 5, 1999 Rev. 2

This revision level of this manual consist of the following changes:
Added AN/ASN-175 GPS system.

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SECTION 1 GENERAL DESCRIPTION

1.1 INTRODUCTION

The MD41-162X/163X is a compact, self -contained GPS Annunciation and Control unit. It combines all the necessary functions required to interface the Trimble 2000APR, 2101, 2101 I/O, AN/ASN-175 and later PLUS version approach-certified GPS receivers with the MD41-244/248 remote mounted relay transfer system. In addition, the MD41-( ) contains several GPS status annunciations used to indicate modes selected by the front panel switches and various inputs from the GPS receiver.

A special ILS override feature has been incorporated to cause the MD41-( ) to automatically switch to the NAV mode when the NAV (VOR) receiver is tuned to an ILS frequency. Other features include dual 20,000 hour lamps used for all annunciations, internally lighted selection switches and automatic photocell dimming. A external annunciation dimming adjustment is provided for balancing low level light conditions.

The MD41-162X/163X series annunciation control unit must be installed with the companion MD41-244/248 series Relay Unit or the AlliedSignal KI 208A/209A course deviation indicator to be approved as a complete TSO'd system.

1.2 SPECIFICATIONS, TECHNICAL

1.2.1 PHYSICAL CHARACTERISTICS

Mounting:	Panel
Width:	2.75 Inches
Height:	.80 Inches
Depth:	3.22 Inches
Weight:	0.50 lbs.

1.2.2 ENVIRONMENTAL CHARACTERISTICS

TSO Compliance:	TSO C129
Applicable Documents:	RTCA DO-160C, DO-208
Operating Temperature Range:	-55°C to +70°C
Humidity:	95% Non-Condensing
Altitude Range:	0 to 55,000 ft.
Vibration:	Cat. M and N
Operational Shock:	Rigid Mounting, 6 G Operational 15 G Crash Safety

1.2.3 SPECIFICATIONS, ELECTRICAL

Design	All Solid State
MD41-1624/1634 (14VDC)	0.40 Amps
MD41-1628/1638 (28VDC)	0.30 Amps
MD41-1628(5V)/1638(5V) (28DC)	0.30 Amps

1.2.4 FRONT PANEL CONTROLS AND ANNUNCIATIONS

1.2.4.1 CONTROLS

NAV/GPS	Alternate action switch, when pressed, will select NAV (VOR) GPS presentation on HSI/CDI.

1.2.4.2 ANNUNCIATIONS

NAV	NAV (VOR) information presented on the HSI or CDI.
GPS	GPS information presented on the HSI or CDI.
MSG	GPS message alert, from the GPS receiver.
WPT	GPS waypoint alert, from the GPS receiver.
APR	GPS is actively engaged in approach mode.
HOLD	Automatic waypoint sequencing is disabled.

1.2.5 INTERFACE

NAV Ann J1 Pin 16	Receives ground from transfer relay when relays are in NAV mode.
GPS Ann J1 Pin 2	Receives ground from transfer relay when relays are in GPS mode.
Lamp Test J1 Pin 7	Receives ground from remote test switch to light all annunciations. (optional connection)
MSG Ann J1 Pin 3	Receives ground to activate annunciation.

1.2.5 INTERFACE (cont.)

WPT Ann J1 Pin 4	Receives ground to activate annunciation.
APR Ann J1 Pin 9	Receives a ground to activate annunciation.
HOLD Ann J1 Pin 10	Receives a ground to activate annunciation.
ILS Override JI Pin 11	Receives a logic low from the NAV (VOR) receiver when tuned to an ILS frequency. This will force the MD41-( ) into NAV mode regardless of the NAV/GPS selection. This connection is optional.

1.2.6 EQUIPMENT LIMITATIONS

The MD41-( ) series control units contain specific dash numbers to be used with various GPS receivers. The installer must match the correct controller part number with the GPS receiver being installed.

The conditions and tests required for TSO approval of this article are minimum performance standards. It is the responsibility of those desiring to install this article either on or within a specific type or class of aircraft to determine that the aircraft installation conditions are within the TSO standards. The article may be installed only if further evaluation by the applicant documents an acceptable installation and is approved by the Administrator.

The MD41-1624/1634/1628/1638/1628(5V)/1638(5V) ACU **MUST** be installed with the Mid-Continent Inst. MD41-244/248 remote transfer relay or the AlliedSignal KI 208A/209A course deviation indicator in order to be approved as a complete TSO system. These items will not be TSO'd if one is installed without the other.

The MD41-1624/1634/1628/1638/1628(5V)/1638(5V) is TSO'D and certified for use with the Trimble 2000APR, 2101, 2101 I/O, AN/ASN-175 and PLUS versions GPS system. Any attempts to install the listed units in an installation other than the listed systems is prohibited. **This will void the TSO.**

NOTE: Anytime the MD41-( ) is disconnected or removed from the aircraft, the HSI/CDI will default to NAV (VOR) mode.

1.2.7 MAJOR COMPONENTS

This system is comprised of two major components, the MD41-162X/163X series GPS Annunciation Control Unit and the MD41-244/248 Remote Relay or the AlliedSignal KI 208A/209A course deviation indicator.

SECTION 2 INSTALLATION CONSIDERATIONS

2.1 COOLING

No direct cooling is required. As with any electronic equipment, overall reliability may be increased if the MD41-( ) is not located near any high heat source or crowded next to other equipment. Means of providing a gentle air flow will be a plus.

2.2 EQUIPMENT LOCATION

The MD41-( ) must be mounted as close to the pilot's field of view as possible. The preferable location is near the HSI/CDI that will be displaying the GPS information. The unit depth, with connector attached, must also be taken into consideration. Note: Unlike previous versions of the MD41 Annunciation Control Units (ACU), the transfer relays have been removed and are now remotely mounted in a separate package designated as the MD41-244/248 Relay Unit. This has allowed a for a smaller size ACU which now provides more options for panel mounting. For systems that utilize the AlliedSignal KI208A/209A, the transfer relays are internal to the indicator.

2.3 ROUTING OF CABLES

Care must be taken not to bundle the MD41-( ) logic and low level signal lines with any high energy sources. Examples of these sources include 400 HZ AC, Comm, DME, HF and transponder transmitter coax. Always use shielded wire when shown on the installation print. Avoid sharp bends in cabling and routing near aircraft control cables.

SECTION 3 INSTALLATION PROCEDURES

3.1 GENERAL INFORMATION

This section contains interconnect diagrams, mounting dimensions and other information pertaining to the installation of the MD41-( ). After installation of cabling and before installation of the equipment, insure that power is applied only to the pins specified in the interconnect diagram.

3.2 UNPACKING AND INSPECTING EQUIPMENT

When unpacking equipment, make a visual inspection for evidence of damage incurred during shipment. The following parts should be included:

1. MD41-1624 (14 volt) or MD41-1628 (28 volt) Horiz. Mount
   MD41-1634 (14 volt) or MD41-1638 (28 volt) Vert. Mount
   MD41-1628(5V) (28volt) 5 volt button lighting Horz. Mount
   MD41-1638(5V) (28volt) 5 volt button lighting Vert. Mount
2. J1 Connector Kit (25 pin, sockets). MCI PN 7014517
3. Installation Manual. MCI PN 8013567

3.3 MOUNTING THE MD41-( )

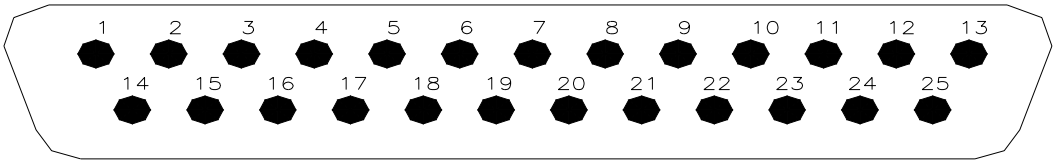
Plan a location in the aircraft for the MD41-( ) to be mounted as close to the pilot's field of view as possible. The preferable location is near the HSI/CDI that will be displaying the GPS information. Avoid mounting close to heater vents or other high heat sources. Allow a clearance of at least 3 inches from back of unit for plug removal.

The indicator is secured in place behind the panel since it is designed for rear mount only. Make a panel cutout as shown in Figure 3-2 Secure the indicator in place with two 4-40 x 3/8 flat head phillips screws.

3.4 INSTALLATION LIMITATIONS

Wire the aircraft harness according to figure 3-3 or 3-4. Use at least 24 AWG wire for all connections. Avoid sharp bends and routing cable near high energy sources. Care must be taken to tie the harness away from aircraft controls and cables. Normal installation techniques should be applied. Also see equipment limitations, section 1.2.6

J1 CONNECTOR

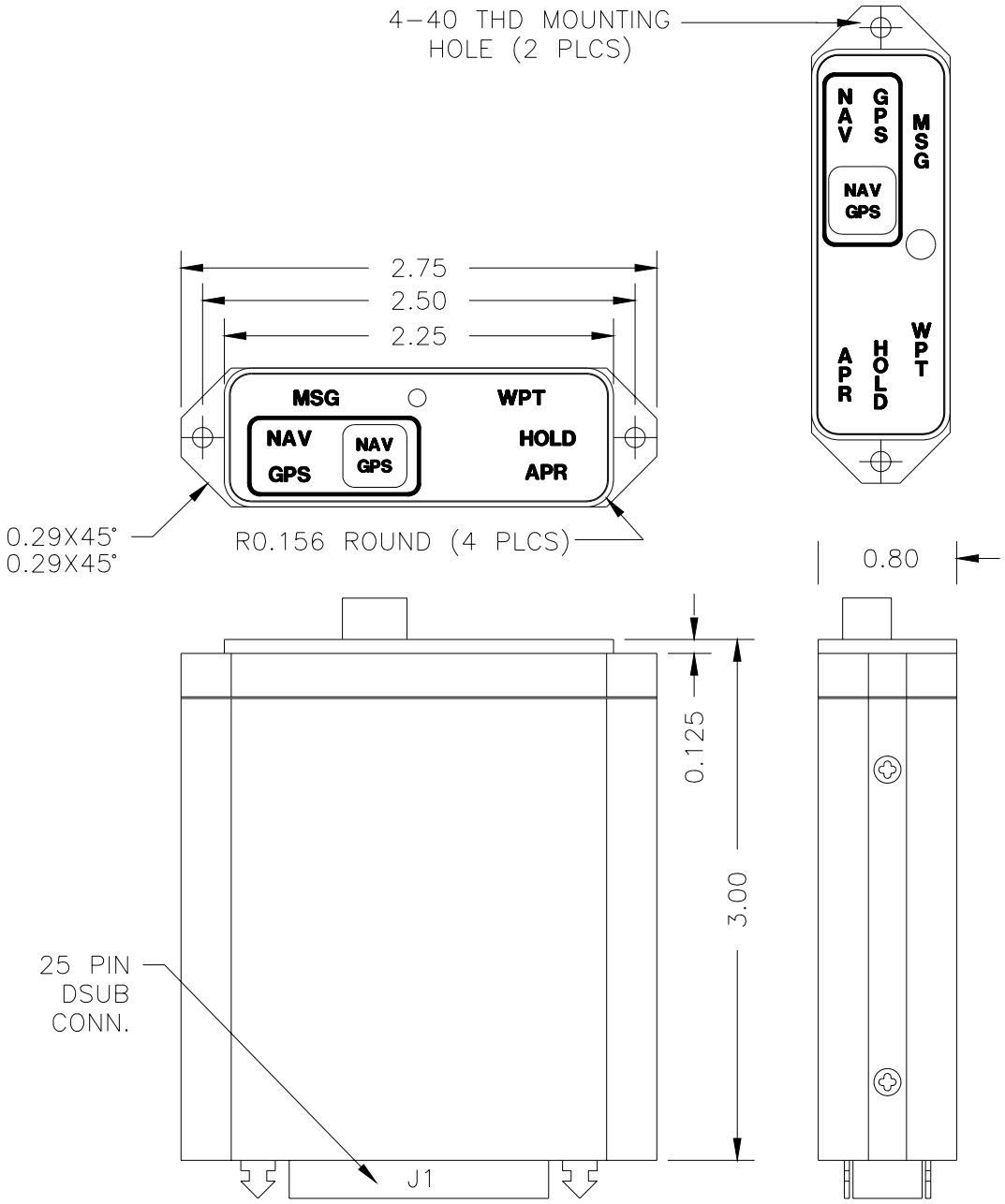


REAR VIEW OF J1 (bottom) CONNECTOR

J1
PIN NO.

1 ----------	TO NAV CIRCUIT BREAKER (for fault monitoring)
2 ----------	GPS ANNUNCIATION (receives ground from remote transfer relays)
3 ----------	MSG ANNUNCIATION (receives ground from GPS receiver)
4 ----------	WPT ANNUNCIATION (receives ground from GPS receiver)
5 ----------	DIMMER IN (from aircraft dimming bus)
6 ----------	SPARE
7 ----------	LAMP TEST (receives ground from remote test switch)(optional conn.)
8 ----------	SPARE
9 ----------	APR ANNUNCIATION (receives ground from GPS receiver)
10 ----------	HOLD ANNUNCIATION (receives ground from GPS receiver)
11 ----------	ILS ENERGIZE
12 ----------	SPARE
13 ----------	14 or 28 VDC UNIT POWER
14 ----------	SPARE
15 ----------	SPARE
16 ----------	NAV ANNUNCIATION (receives ground from remote transfer relays)
17 ----------	SPARE
18 ----------	SPARE
19 ----------	SPARE
20 ----------	SPARE
21 ----------	SPARE
22 ----------	SPARE
23 ----------	SPARE
24 ----------	EXTERNAL RELAY ENERGIZE (ground to energize remote transfer relays when GPS is selected)
25 ----------	POWER GROUND

FIGURE 3-1 SCHEMATIC PINOUT, 25 PIN DSUB



Note 1: Use two 4-40 X 3/8" Flat Head Phillips Screws for Mounting

FIGURE 3-2 OUTLINE DRAWING

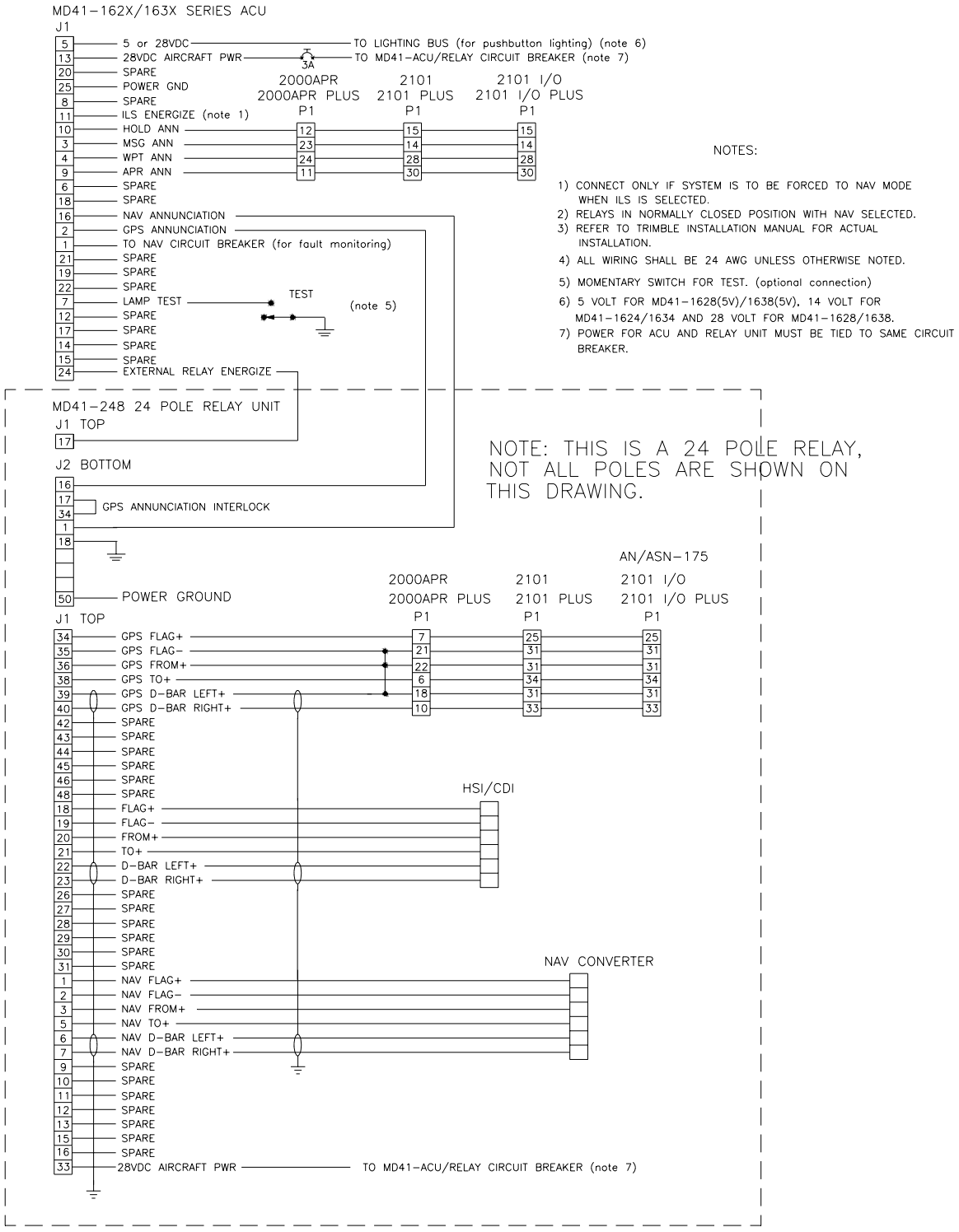
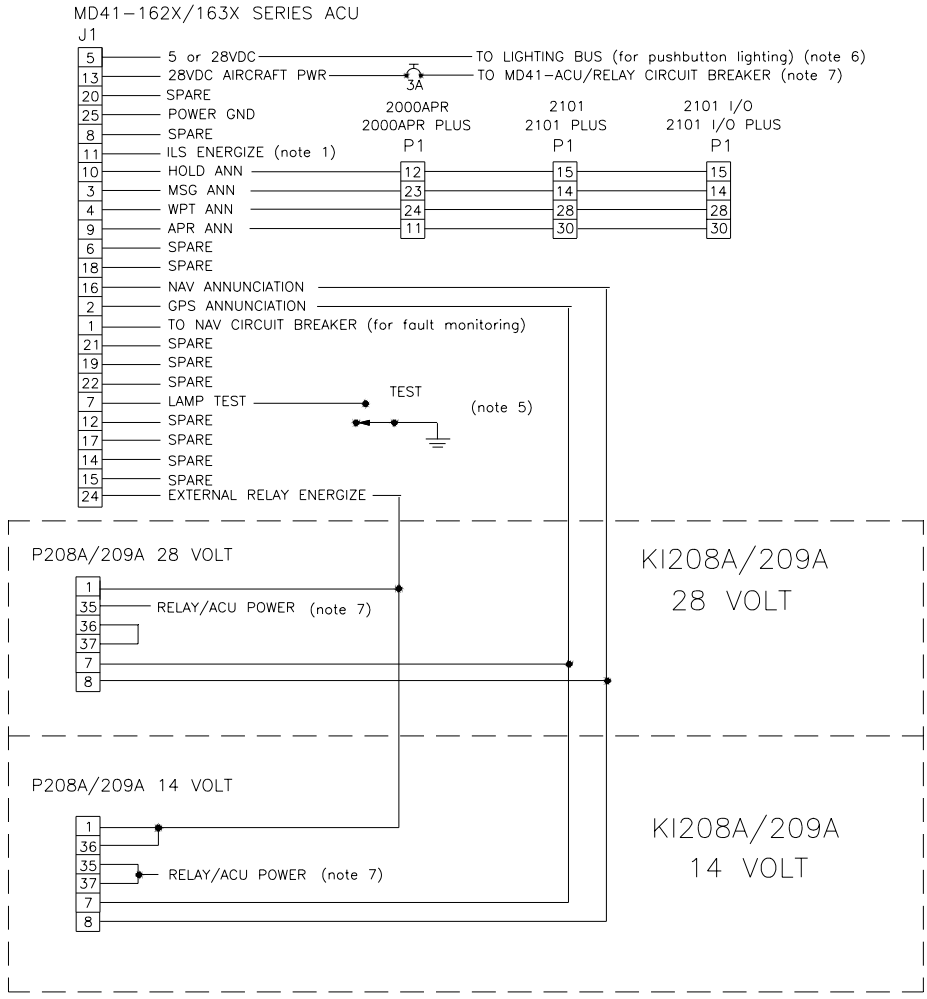


FIGURE 3-3 WIRING DIAGRAM, MD41-1624/1634,1628/1638/1628(5V)/1638(5V) for 2000APR, 2101, 2101 I/O, AN/ASN-175 including PLUS versions GPS systems.



NOTES:

1) CONNECT ONLY IF SYSTEM IS TO BE FORCED TO NAV MODE WHEN ILS IS SELECTED.
2) RELAYS IN NORMALLY CLOSED POSITION WITH NAV SELECTED.
3) REFER TO TRIMBLE INSTALLATION MANUAL FOR ACTUAL INSTALLATION.
4) ALL WIRING SHALL BE 24 AWG UNLESS OTHERWISE NOTED.
5) MOMENTARY SWITCH FOR TEST. (optional connection)
6) 5 VOLT FOR MD41-1628(5V)/1638(5V) AND 28 VOLT FOR MD41-1628/1638.
7) POWER FOR ACU AND RELAY UNIT MUST BE TIED TO SAME CIRCUIT BREAKER.

FIGURE 3-4 WIRING DIAGRAM, MD41-1624/1634/1628/1638/1628(5V)/1638(5V) SERIES ACU WITH AlliedSignal KI 208A/209A COURSE DEVIATION INDICATOR FOR THE 2000APR, 2101, 2101 I/O, AN/ASN-175 including PLUS versions GPS systems.

SECTION 4 POST INSTALLATION CHECKOUT

4.1 PRE INSTALLATION TESTS

With the MD41-( ) disconnected, turn on the avionics master switch and verify that aircraft power is on pin 13. Using an ohm meter, verify pin 25 is aircraft ground.

4.2 OPERATING INSTRUCTIONS

Turn off the avionics master switch and connect the mating connector to the MD41-( ). Turn on the avionics master switch and the MD41-( ) should come on with the following annunciations.

1. NAV or GPS
2. MSG and/or WPT may be flashing depending on the status of the GPS receiver.

Select test (if installed) with the remote test switch. All annunciations should light. Continue selecting test and cover the photocell window located in the center of the front panel. All annunciations should dim.

Annunciation brightness at the minimum dimming level may be adjusted by rotation of the dimmer control located on the bottom of the MD41-( ). CW rotation lowers the dimming level.

Select NAV using the NAV/GPS button. The presentation on the HSI/CDI will now be information from the NAV (VOR) receiver. Using a VOR test generator or equivalent VOR signal, verify that the presentation and operation of the HSI/CDI is correct. This will include course resolver, left-right meter, to-from meter and nav warn flag. Now select GPS on the MD41-( ) and tune the VOR receiver to an ILS frequency. The MD41-( ) will be forced to NAV mode and ILS information will be displayed on the HSI/CDI. **NOTE**, this feature will not work if "ILS Energize" (J1 pin 11) was not connected at the time of installation.

Please refer to Section 3 of the Trimble 2000APR, 2101, 2101 I/O (PLUS) installation manual for the remaining system tests. Refer to section 2 for AN/ASN-175.

No periodic maintenance or calibration is necessary for continued airworthiness of the MD41-( ).

ENVIRONMENTAL QUALIFICATION FORM

RTCA / DO160C

NOMENCLATURE: MD41-( ) GPS ANNUNCIATION CONTROL UNIT

MODEL NO: MD41-( ) TSO NO: C129

CLASS A1

MANUFACTURER TEST SPECIFICATION: MPS 7015613

MANUFACTURER: MID-CONTINENT INSTRUMENT CO., INC.
9400 E. 34th Street N.
WICHITA, KS 67226 PHONE (316) 630-0101

Conditions	Section	Description of Conducted Tests
Temperature and Altitude Low Temperature High Temperature In-Flight Loss of Cooling Altitude Decompression Overpressure	4.0 4.5.1 4.5.2 & 4.5.3 4.5.4 4.6.1 4.6.2 4.6.3	Equipment tested to Categories A1 & F2 except as noted Cooling air not required Not Tested
Temperature Variation	5.0	Equipment tested to Category B
Humidity	6.0	Equipment tested to Category A
Shock Operational Crash Safety	7.0 7.2 7.3	Equipment tested per DO-160C Par. 7.2.1
Vibration	8.0	Equipment tested without shockmounts to Categories M and N (Table 8-1)
Explosion	9.0	Equipment identified as Category X, no test required
Waterproofness	10.0	Equipment identified as Category X , no test required
Fluids Susceptibility	11.0	Equipment identified as Category X, no test required

Environmental Qualification (cont.)

Conditions	Section	Description of Conducted Tests
Sand and Dust	12.0	Equipment identified as Category X, no test required
Fungus	13.0	Equipment identified as Category X, no test required
Salt Spray	14.0	Equipment identified as Category X, no test required
Magnetic Effect	15.0	Equipment tested to Class Z
Power Input	16.0	Equipment tested to Category B
Voltage Spike	17.0	Equipment tested to Category A
Audio Frequency Susceptibility	18.0	Equipment tested to Category B
Induced Signal Susceptibility	19.0	Equipment tested to Category A
Radio Frequency Susceptibility	20.0	Equipment tested to Category T
Radio Frequency Emissions	21.0	Equipment tested to Category Z
Lightning Induced Transient Susceptibility	22.0	Equipment identified as Category X, no tests required
Lightning Direct Effects	23.0	Equipment identified as Category X, no tests required
Icing	24.0	Equipment identified as Category X, no test required